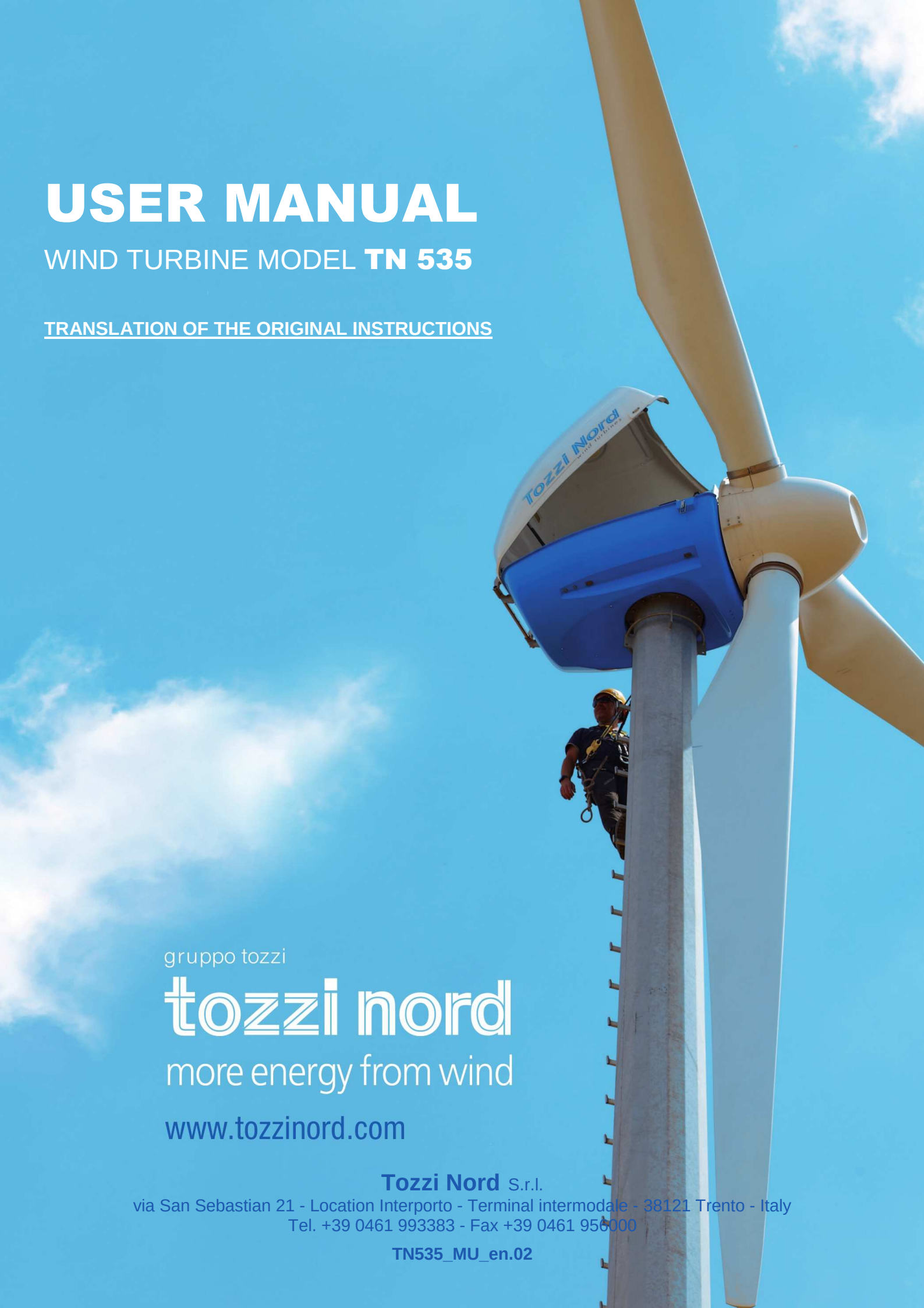
USER MANUAL

WIND TURBINE MODEL **TN 535**

TRANSLATION OF THE ORIGINAL INSTRUCTIONS



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Facsimile of EC Declaration of Conformity provided by the manufacturer:

EC Declaration of Conformity

Place and Date:

MANUFACTURER
Tozzi Nord S.r.l.
Via San Sebastian 21
I-38121 TRENTO

DECLARES THAT THE FOLLOWING PRODUCT:

- Generic denomination: TN535
- Function: Wind Energy Conversion System
- Model: TN535
- Type: TN535
- Serial number:
- Commercial name: TN535

FULFILS THE ESSENTIAL REQUIREMENTS OF THE FOLLOWING EC DIRECTIVES:

- "Machinery" directive 2006/42/EC and the regulations transposing it into national law;
- "Low Voltage" directive 2006/95/EC and the regulations transposing it into national law;
- "Electromagnetic Compatibility" directive 2004/108/EC and the regulations transposing it into national law.

Related standards applied:

- IEC 61400-2: Products – Part 2: Design requirements for small wind turbines;
- EN12100-1;
- EN12100-2.

Person authorised to write the technical dossier (1):

Position: Technical Office Director
Address: Via San Sebastian 21, I-38121 Trento.

Signature
(Legal Representative)
ANDREA TOZZI

(1): The person given the authority within the Community to put together the technical dossier and to make it readily available.

A. INFORMATION

A.1. Symbols

The following symbols are used in this manual to alert the reader to different Danger levels when using the Product:

Danger

Indicating an imminent hazard, this symbol refers to specific information or procedures which must be followed exactly in order to avoid risk of death, serious personal injury, or damage to the Product. It often refers to "residual Risks" or, in any case, dangerous conditions.

Warning

Indicating a potential hazard, this symbol refers to information or procedures advising the User on the best way to use the machine in order to prolong its life, avoid damage or loss of programming data and optimize work in compliance with standards.

Note

Indicating additional information that may be useful for the User.

A.2. Foreword

Warning

The Products and procedures comply with current European safety of machinery and safety in the workplace Standards and Directives.

However, it is a priority and compulsory to refer and respect the current Standards and Directives in the country of use of the Product.

A.3. Information concerning the publication

A.3.1. Purpose of the manual

The User manual's purpose is to provide the instructions for:
- reading the functional data provided by the Product's human user interface;
- correct interpretation of the functional data;
- correct use of the controls and instruments available at the Product's "**Client Command Level**";
- safety.

A.3.2. Subjects

The subject of this manual is the User as defined in chapters A.4 and A.6.

A.3.3. Exclusions

This publication DOES NOT address the following items:
- spare parts;
- maintenance;
- installation;
- dismantling of the Product, or of its parts;
- repair;
- adjustment;
- controls and instruments located at the "**Service Command Level**".

Such operations must only be carried out by Tozzi Nord trained and authorized personnel.

A.3.4. Structure of the publication

The manual is composed of separate sections with an initial index showing the sequence of titles of the sections, the chapters, and the topics addressed with reference to the page numbers.
Pages are numbered in ascending order, with an indication of the total number of pages in the document.

In this publication the term "**Product**" refers toTozzi Nord's wind turbine model **TN 535**

Note

The original language is Italian.

A.4. User information

A.4.1. Informed operative

The User is defined as an informed operative who is required to read and understand the instructions contained in the User manual and who may perform certain limited safety operations described in section D. Safety.

A.4.2. User tasks

The User:
- **may** access the Client Command Level in order to:
  - check functional parameters on the display;
  - turn off the electricity from the main electrical supply by putting **SA41** into position **OFF** (see chapter **C.1.2.**) and then also moving **QS11** to **OFF** (see chapter **C.1.1.**);
  - select the Product's operating mode by turning **SA41** to the required position (see section **C.1.2.**);
- **may** take certain limited safety actions which are described in section "**D. Safety**";
- **must** collect information regarding any Dangers, Risks or anomalous situations which could occur at the Product site;
- **must** report to Tozzi Nord Technical Assistance Centre any anomalies, alarms or potentially dangerous and/or unresolved situations.

Tozzi Nord Technical Assistance Centre - Tel. +39 0461 993383.

A.4.3. User safety requirements

The User must be in good physical and psychological conditions and not have any particular impediments to correctly reading or controlling the instruments provided (including this User manual).

A.4.4. Arbitrary modifications

It is strictly forbidden to modify any part of the Product for any reason whatsoever without the express authorization of the manufacturer.
Agents or representatives of the manufacturer are not authorized to make any modifications affecting the User manual except by express written consent from the manufacturer.
The manufacturer declines all liability in relation to unauthorised modifications and reserves the right to take any actions it deems necessary to protect its interests.

A.4.5. User's responsibilities

The User is responsible for any damage to himself, third parties, or objects resulting from:
- improper use (defined in chapter **A.5.4**.) of the Product or any of its parts;
- defects caused by failure to comply with the safety instructions (as defined in chapter "**D Safety**") and accident prevention regulations.
- operations reserved for Tozzi Nord's trained and authorized personnel.

It is the User's duty to notify Tozzi Nord Technical Assistance Centre of any dangerous or anomalous situations which may occur..

A.4.6. Manufacturer's responsibilities

The manufacturer is not responsible for any consequences resulting from alterations to the environmental conditions after installation (e.g. area at Risk of explosion, the presence of corrosive particles, etc.) or for any incorrect or improper use of the Product such as:
- a method of use not in conformity to that outlined in this publication;
- removal or disabling of active or passive safety devices;
- instances of vandalism by third parties;
- irresponsible conduct not in compliance with good common practice;
- unauthorised modifications.

A.5. Intended Use

A.5.1. Conditions of use

The Product is designed to be installed and used only in Danger-free locations (not at risk of explosions as defined by regulation IEV426-03-02) and those with a class IV wind regime as defined by standard IEC 61400-2.

Note

The Product's operating temperature range is between -10℃ and 40℃.

Tozzi Nord denies liability for malfunction, injury to persons or damage to objects caused by failure to use the Product in compliance with this manual.

A.5.2. Environmental Conditions

The Product is designed to withstand standard Class IV wind as defined in section 6 of CEI/IEC 61400-2; the Product is designed to be used under the following environmental conditions:.

Wind conditions:		
SWT Class	IV	
Reference wind speed Vref (10 min average, Hub height, recurrence time 50 years)	30.0	[m/s]
Annual average wind speed Vave	6.0	[m/s]
Turbulence intensity level at 15m/s I15	0.18	[-]
Dimensionless slope parameter a (to be used for the calculation of standard deviation turbulence as a function of VHub and I15)	2.0	[-]
Expected extreme wind speed Ve50 (3 sec average, Hub height, recurrence time 50 years)	42.0	[m/s]
Expected extreme wind speed Ve1 (averaged over 3 s, recurrence time 1 years)	31.5	[m/s]
Design wind speed	8.4	[m/s]
Other Environmental conditions:		
Normal temperature range	-10<T<40	[℃]
Relative humidity of the air	<95%	[-]
Air density □	1.225	[kg/m3]
Solar radiation	1000	[W/m2]
Lightening protection system electric scheme described in:	[Ref. 4], [Ref. 5], [Ref.6]	
Atmospheric content equivalent to that of a non-polluted inland atmosphere (see IEC 60721-2-1);		
Earthquake model: TN535 standard Towers and foundations are verified according to "Decreto Ministeriale 14.01.2008,Testo Unitario - Norme Tecniche per le Costruzioni" (NTC08), seismic class-II		
Electrical network conditions:		
Normal supply voltage and range	400±10%	[V]
Normal supply frequency and range	50±3%	[Hz]

Table 1 - Summary of environmental conditions for which TN535 is designed

Should the installation site's environmental conditions not comply with the design conditions, Tozzi Nord cannot be held responsible for any malfunctions, including but not limited to property damage and/or persons and/or loss of energy yield.

A.5.2.1. Cold climate

Standard Product is rated and tested for a temperature range of between -10℃ and +40℃.
When operating at maximum temperatures, power may automatically and temporarily fall, according to the thermal cycles and environmental conditions. Using the Product outside the specified temperature range will not result in a risk of injury.
There are several options for equipping the Product for use in a wider temperature range: heating and/or insulation of the electrical cabinet, additional ventilation in the electrical cabinet, different types of lubricants, to be implemented according to customer requirements and the features of the site.

A.5.2.2. Wind farm influence

The loads acting on the Products are calculated for a single Product installation.
In the case of multiple installations, we recommend a minimum distance of 5 to 10 times the rotor diameters between wind turbines, depending on the prevalent wind directions.

A.5.2.3. Complex terrain and altitude limitation

The loads acting on the Products are calculated for a non-complex terrain site as defined on GL Guidelines section 4.4.7.
Standard Product can reach the rated power up to 1.000 m above the sea level. The installation and use of the Product over the above mentioned altitude must be noticed by the customer to Tozzi Nord in order to quantify the performance losses and define possible limitation of use.

A.5.3. Proper use

The Product can be used in all the conditions specifically described in the User Manual.
The operation of the Product is fully automatic and does not require the constant supervision by operators.
It is not therefore expected that the User take actions for regulation and/or maintenance purposes.
The User Manual must be available to the User before the Product is put into service.
No components or safety devices relating to the Product must ever be tampered with.

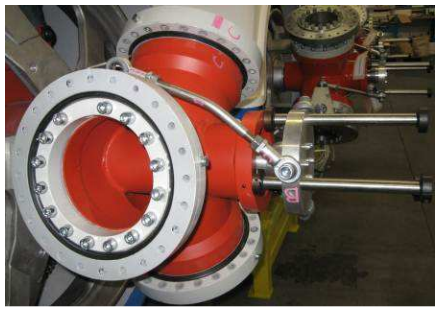
A.5.4. Improper use

The User **is strictly forbidden** to climb the Tower or to attempt any sort of installation, maintenance or adjustment operation that must be exclusively carried out by Tozzi Nord's authorized and trained personnel.

Danger

It is forbidden to carry out any operations which are not described in, or are contrary to, the contents of this manual.

A.6. Glossary

Client Command Level	The first control interface encountered when opening the outer door of the Control and Power Panel.	
Control and Power Panel	Cabinet containing control and power electrical devices. It is located at the Tower's base and it is fixed on the foundations by means of concrete wedge anchors.	
Danger	Potential cause of injury or health hazards.	
Exposed Person	Anyone who is entirely or partly inside a Hazardous Zone.	
Hazardous Zone	Any area inside and/or in the proximity of the Product in which the presence of an Exposed Person constitutes a Risk for their health and safety.	
Housing	Glass Fiber Reinforced Plastic cell or body covering the chassis and the generating components.	
Hub	Rotary front part of the Product onto which the blades are installed.	
PPE	Personal Protective Equipment	
Intended Use	Use of the Product in compliance with the information provided in the User Manual.	
Locking Pin	Metal pin preventing pulley and Hub rotation.	

Nacelle	Part of the Product made up of the housing and all of the generating components including the generator, drive train, chassis, brake assembly and hub.	
Pitch Angle	The angle at which the blade rotates around its longitudinal axis.	
Pitch System	System that enables the blade angle to be adjusted, using three connectors (as shown in the picture).	
Protective Device	Device designed to reduce risk of injury, on its own or in conjunction with a guard.	
Risk	Combination of the probability and degree of seriousness of possible injury or harm to health in a dangerous situation.	
Rotational Speed	Expressed in rpm, this represents the number of rotations per minute made by each of the blades.	
Service Command Level	The control interface encountered when opening the inner door of the Control and Power Panel. The inner door is locked by means of a code locking device.	
Spinner	Fibreglass covering component integrating the Hub.	
Tower	The Nacelle and Rotor support structure part of the Product, fixed to the ground by a concrete foundation.	
User	An authorised informed operative who has carefully read the Product's User manual.	
Wind Turbine or Product	Operating machine which converts kinetic energy contained in the wind into electrical energy.	
Yaw	Rotation of the Product on the horizontal plane, in order to follow the direction of the wind.	
Yaw System	System allowing the Nacelle to revolve around the Tower's axis.	

B. DESCRIPTION

B.1. Product description

The Product is classified as a wind energy conversion system. It converts kinetic energy contained in the wind into electrical energy and supplies it to the low voltage grid.
The Product is a Horizontal Axis Wind Turbine (HAWT) especially designed to maximize the energy harvest on sites characterized by low wind speed (annual average wind speed at Hub height below 6m/s).

B.2. CE marking

For unequivocal identification of the Product, the User shall refer to the following data stated on the CE marking, fixed next to the hatch of the support Tower.
The CE marking states the following:

1 Name, address and logo of the manufacturer
2 CE Mark
3 Product name
4 Model
5 Serial number
6 Year of manufacture
7 Maximum voltage
8 Maximum current
9 Frequency

Tozzi Nord s.r.l.
Via San Sebastian, n°21
38121 Trento - Italy

CE

Modello Aerogeneratore: TN535
Wind Turbine model: TN535

S/N : TN535.XXXX

Anno di fabbricazione/Year of Manufacture: XXXX

Massima Tensione/Max Voltage:	480 V
Massima Corrente /Max Current:	18 A
Frequenza lato rete/Grid Frequency :	50 Hz

B.3. Signals

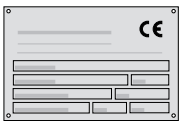
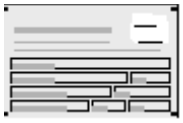
B.3.1. Prohibition signals

1	**PRODUCT ACTION RADIUS**		ACCESS AND TRANSIT FORBIDDEN TO ALL UNAUTHORIZED PERSONNEL BY TOZZI NORD WITHIN A 7M RADIUS OF THE PRODUCT
2	**OPENING THE ELECTRICAL PANEL INNER DOOR**		UNSKILLED PERSONNEL OR PERSONNEL UNAUTHORIZED BY TOZZI NORD MUST NOT OPEN THE INNER DOOR OF THE POWER AND CONTROL PANEL

B.3.2. Danger signals

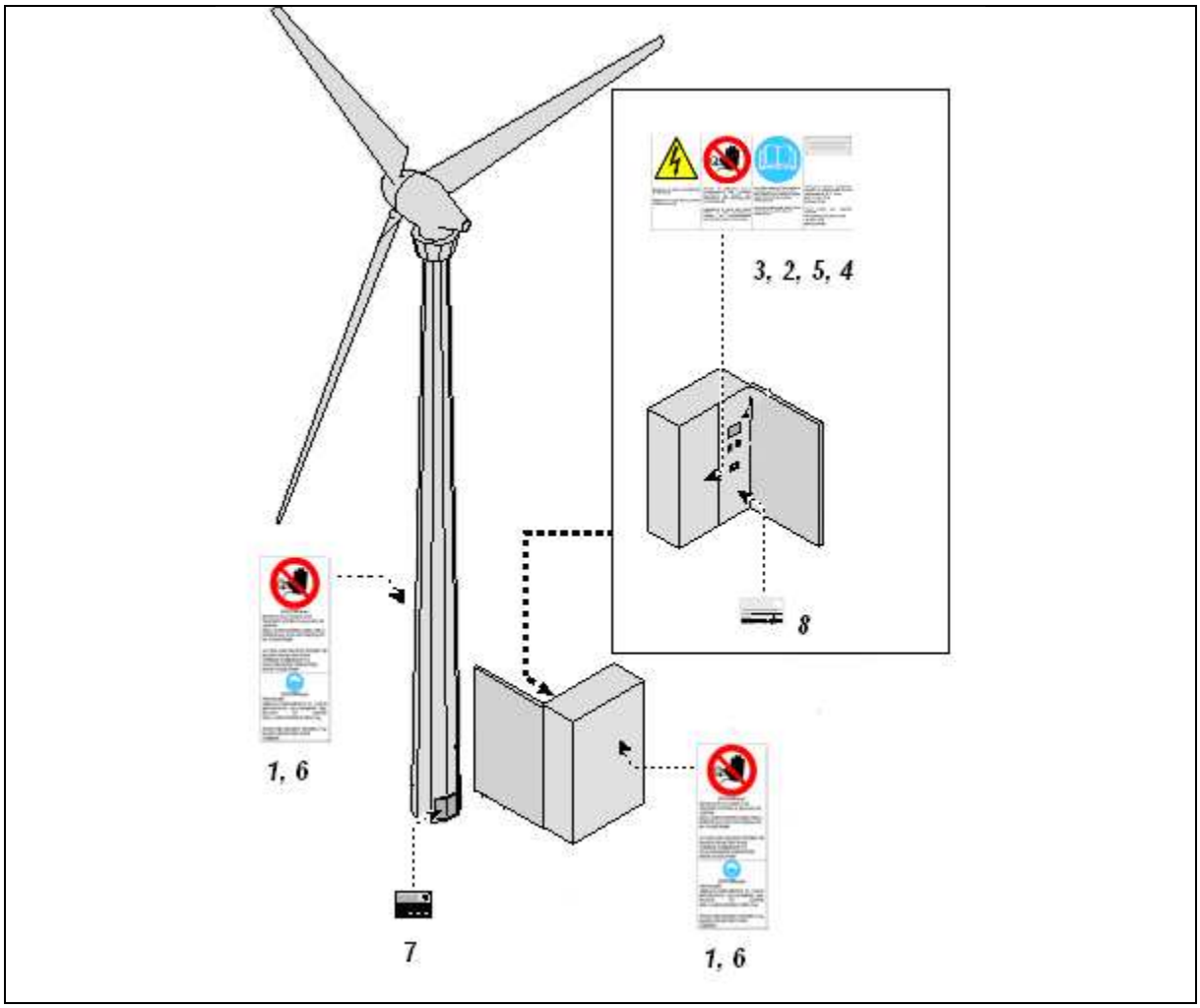
3	**LIVE ELECTRICAL PARTS**		PRESENCE OF LIVE ELECTRICAL PARTS

B.3.3. Other signals and plates

4		This gives the telephone number and address of the Technical Assistance Centre.
5		The User must read the User manual before performing any operation at the Client Command Level.
6		Mandatory use of helmet within a 7m radius from the Product.
7		CE marking.
8		Power and Control Panel identification plate.

B.3.4. Positioning of signs

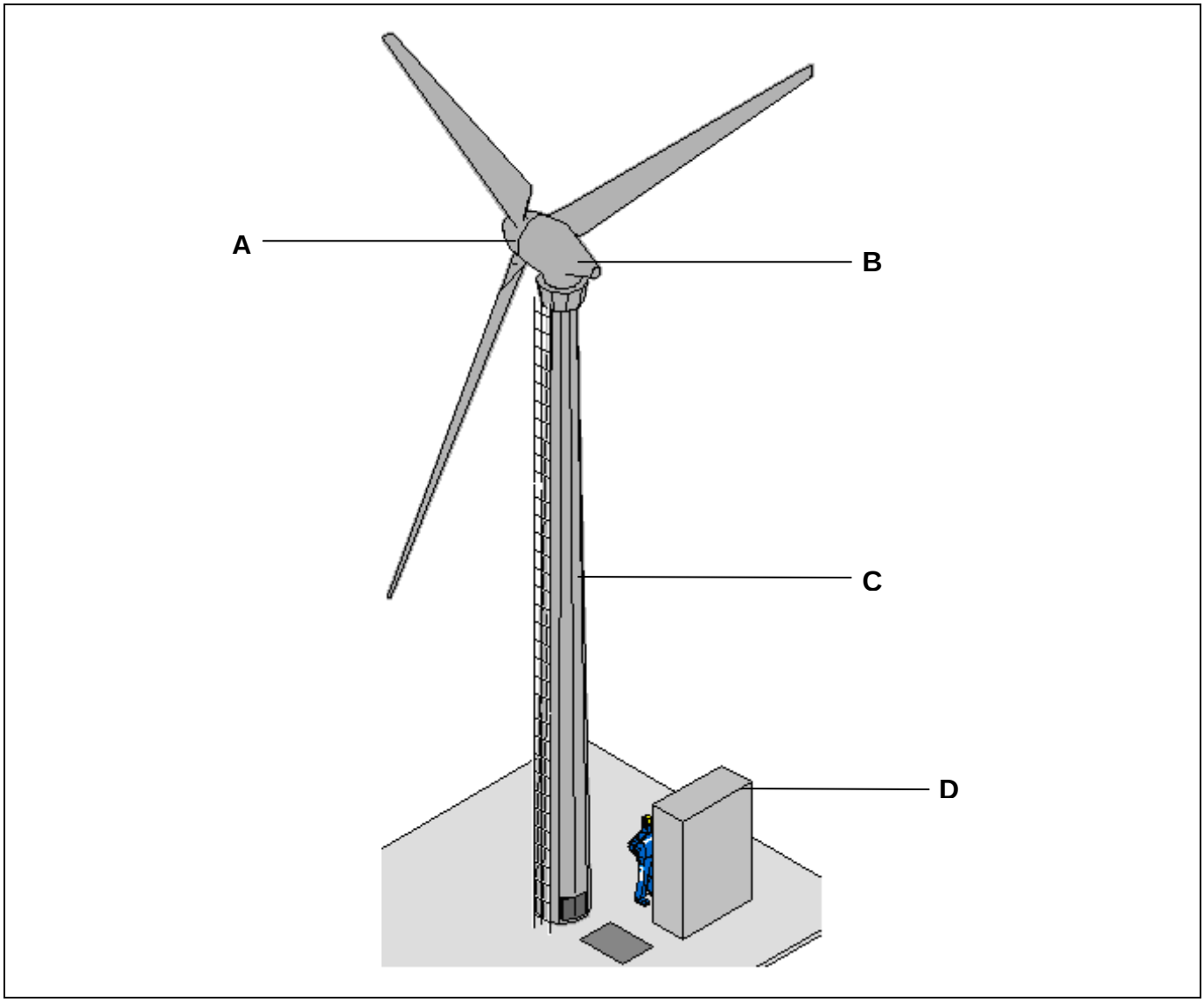
Safety signs are included in the Product's safety devices.
The materials are able to withstand stress and will last as long as the Product itself.
If any signs are damaged or removed, they must be immediately replaced by the User/client.



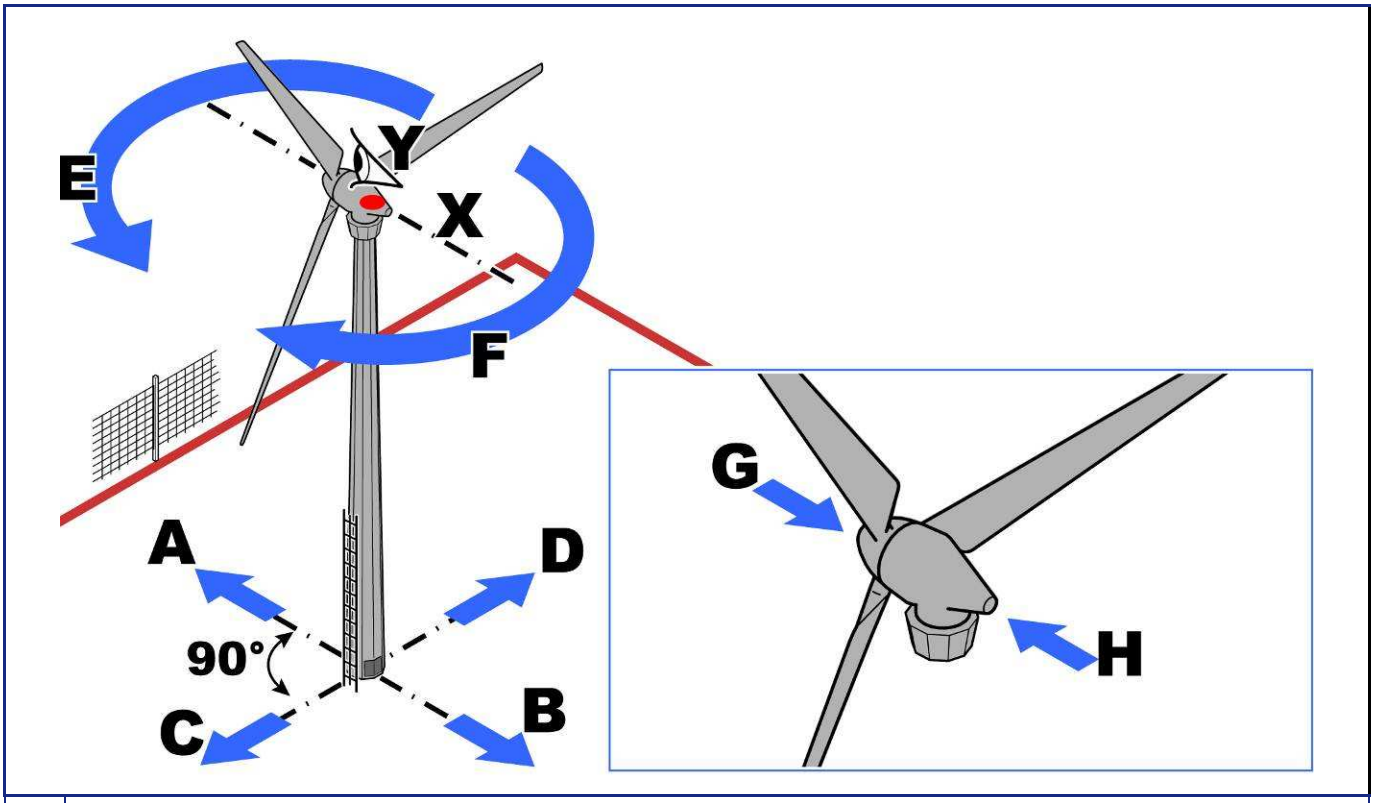
B.4. Main components

The Product is composed of the following main elements:

A Upwind three-bladed horizontal axis rotor.
B Nacelle.
C Tower.
D Control and Power Panel.



B.5. Yaw



A	Front side
B	Rear side
C	Left-hand side
D	Right-hand side
E	Rotor anti-clockwise rotation
F	Rotor clockwise rotation
G	Nacelle frontal area (Hub side)
H	Nacelle rear area
X	Rotational axis of the Rotor. This axis must be positioned at a 90° angle with the position to the ladder (C side) during installation/maintenance operations (ladder mounted).
Y	View point

C. CONTROLS AND INSTRUMENTS

C.1. Client Command Level

The selectors, switches and buttons mentioned in the present chapter are located on the inner door of the Control and Power Panel, which constitutes the Client Command Level.

C.1.1. Turn Main Switch (QS11)

Warning

Move QS11 to OFF position only AFTER turning selector SA41 to OFF position (see chapter C.1.2.).

The selector labelled MAIN SWITCH (**QS11**) turns off the electricity from the main grid supply.

C.1.2. Operating selector (SA41)

The selector enables the following operational statuses:

STANDBY: the blades are in feathering position. The yaw control is active. When the Product is generating power in AUTO mode, move the selector to STANDBY mode to halt the rotor.

We recommend activation of this function in the event of predicted adverse weather conditions (see section D.4).

OFF: the blades are in feathering position. The yaw control is inactive. When the Product is generating power in AUTO mode, move the selector to OFF mode to halt both the rotor and yaw system.

We recommended you switch SA41 to OFF before turning off the electricity from the supply grid.

AUTO: Product's automatic operational mode (managed by the PLC).

C.1.3. Human Machine Interface (HMI)

The Product's User interface consists of a text display provided with five buttons (**F1÷F5**).

Press **F1÷F5** to access the following information:

F1: Current values

Rotor speed:	rpm
Power:	kW
Wind speed:	m/s
Wind direction:	°
Number of Nacelle revolutions:	-
Temperature of the generator:	℃
Vibration:	g
Auxiliary supply voltage:	VDC
Software version:	text

F2: Historical data

Total energy produced.
Total energy produced during the year.
Total energy produced during the current month.
Total energy produced from midnight onwards on the current day.
Total hours of inverter functioning.

F3: Monthly values

The monthly values for energy Production and average wind speed.

F4: Warnings

Reports any currently active warnings.

F5: Product status and alarm messages

Reports any currently active alarms.

D. SAFETY

D.1. Safety Instructions

The Product is fully automatic and does not require any operator supervision.
The User is not therefore expected to operate the Product for regulation and/or maintenance purposes.
The User may access the Client Command Level in order to:

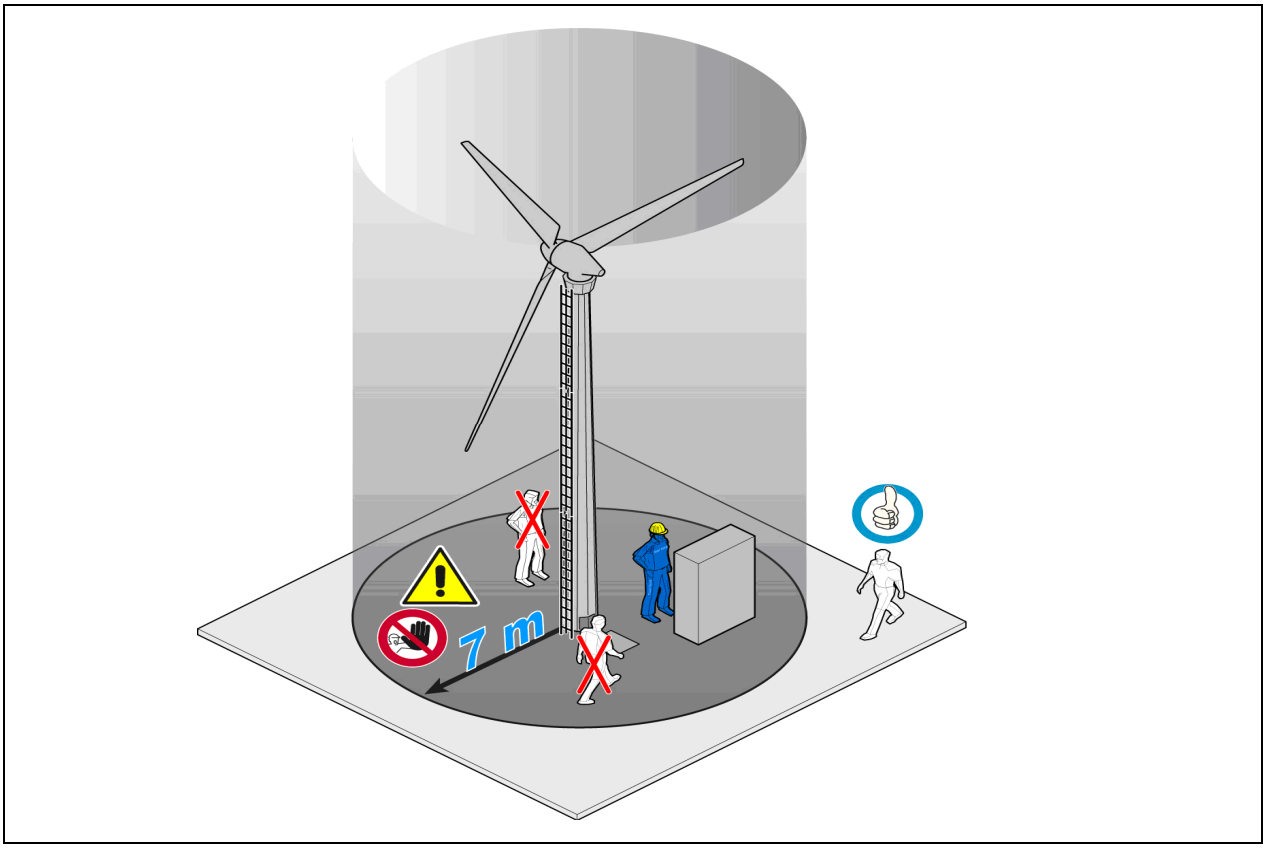
- check functional parameters on the display;
- turn off the electricity from the main electrical supply by putting **SA41** into position **OFF** (see chapter **C.1.2.**) and then also moving **QS11** to **OFF** (see chapter **C.1.1.**);
- select the Product's operating mode by turning **SA41** to the required position (see section **C.1.2.**);

Warning

Do not tamper with any safety device or any other component of the Product.

The User is strongly advised not to stand or position vehicles within the action radius of the Product (the radius extends in a circle approximately 7m around the Tower). In any case, a protective helmet must always be worn.

In case of obvious malfunctioning of the Product, unusual noise, ice accretion, significant atmospheric events, seismic events, fire or floods, **it is COMPULSORY to keep away from the Product**.



Warning

Access to the Tower, installation, maintenance, or control operations must be carried out exclusively by Tozzi Nord trained and authorized personnel.

Any Product malfunction must be reported by the User to the Tozzi Nord technical assistance office.

D.2. Access to the Client Command Level

The User can access to the Client Command Level by opening the outer door of the Control and Power Panel, positioned at the base of the Tower.
The Client Command Level allows the User to monitor the Product's functional data.

Warning

Opening the inner door of the Control and Power Panel is restricted to Tozzi Nord trained and authorized personnel. At the Service Command Level there are live components with voltage exceeding 600VdC and 400V AC.

The User is responsible for keeping the Control and Power Panel's outer door properly closed. The manufacturer declines any liability for any direct or indirect damage due to vandalism or water entry resulting from the improper closure of the outer door.

D.3. Fire

If the Product or of any of the associated system components should catch fire, the User is advised to turn off the electricity from the main grid supply as long as this action does not put the User at Risk. The relevant authorities must be noticed in all cases.

D.4. Extreme weather conditions forecast

In the event of extreme wind speed forecast (above force 9 on the Beaufort scale), the User is advised to put the Product into standby mode using the **SA41** switch (see chapter **C.1.2.**).

Refer to the following table to evaluate the effect of the wind:

Wind force		**Wind speed**		**Effect of the wind**
Beaufort degree	**Name**	**m/s**	**km/h**	
0	Calm	0÷0.2	1	Calm, smoke rises in a straight line
1	Light movement of air	0.3÷1.5	1÷5	Direction of the wind indicated only by the movement of smoke, but not by a flag
2	Light wind	1.6÷3.3	6÷11	You feel the wind on your face, the leaves are rustling, the flag is moving
3	Light breeze	3.4÷5.4	12÷19	Leaves and branches are moving, the wind can stretch light flags out
4	Moderate breeze	5.5÷7.9	20÷28	The wind raises dust and loose papers, moving branches and small sticks
5	Fresh breeze	8.0÷10.7	29÷38	Small broad-leaved trees start to swing Ripples rise on lakes
6	Strong wind	10.8÷13.8	39÷49	Strong branches are moving, telegraphic lines whistle, it is hard to use umbrellas
7	Tight wind	13.9÷17.1	50÷61	All trees are moving, it is difficult to move against the wind
8	Stormy wind	17.2÷20.7	62÷74	Branches break off trees, it is difficult to walk outside
9	Storm	20.8÷24.4	75÷88	Minor damage to houses (destroying the covers of chimneys and tiles)
10	Violent storm	24.5÷28.4	89÷102	Uprooted trees, damage to houses

D.5. Behaviour in the case of alarm and/or breakdown

Warning

If the alarm flashes, the User is forbidden to restart the Product without the authorization of the Tozzi Nord Technical Assistance Centre.

In the case of alarm or breakdown, please urgently report the following information to the Tozzi Nord Technical Assistance Centre:

- Product serial number;
- Product model;
- Site name;
- Product status.

Tozzi Nord Technical Assistance Centre
Tozzi Nord S.r.l
Registered Office: Via San Sebastian 21
Location Interporto - Terminal Intermodale - 38121 Trento - Italy
Tel. +39 0461 993383 - Fax +39 0461 956000
email: assistenzatn@tozziholding.com

D.6. Electrical feed, disconnection, and supply failure

In normal operating conditions, the feed for the control system of the Product is derived from the mains electricity supply.
The selector labelled **MAIN SWITCH** (**QS11**), positioned on the storage door of the electrical control cabinet, is used to disconnect the Product from the mains supply.

Warning

You are advised FIRST to move selector SA41 to OFF (see chapter C.1.2.) and then QS11 to OFF (see chapter C.1.1.).

After turning selector **MAIN SWITCH** (**QS11**), or following a power cut, the Product will use its own internal back-up system to set park/safety status (turning the blade Pitch Angle until it reaches feathering position). If the electricity supply is not restored within twenty (**20**) minutes, the controller will turn off the control system to preserve battery life.
When the electricity supply is restored, or when selector **MAIN SWITCH** (**QS11**) is returned to **ON**, the Product will restart automatically.

E. OPERATING FUNCTIONS

E.1. Product operating status

The Product's control logic is entrusted to a programmable logic controller (PLC) and based on about 50 parameters monitored by means of estimates and/or special sensors.
The figure below shows the operating range of the Product. The controller always keeps the Product inside the consented range. All start-up and shutdown procedures are performed automatically.

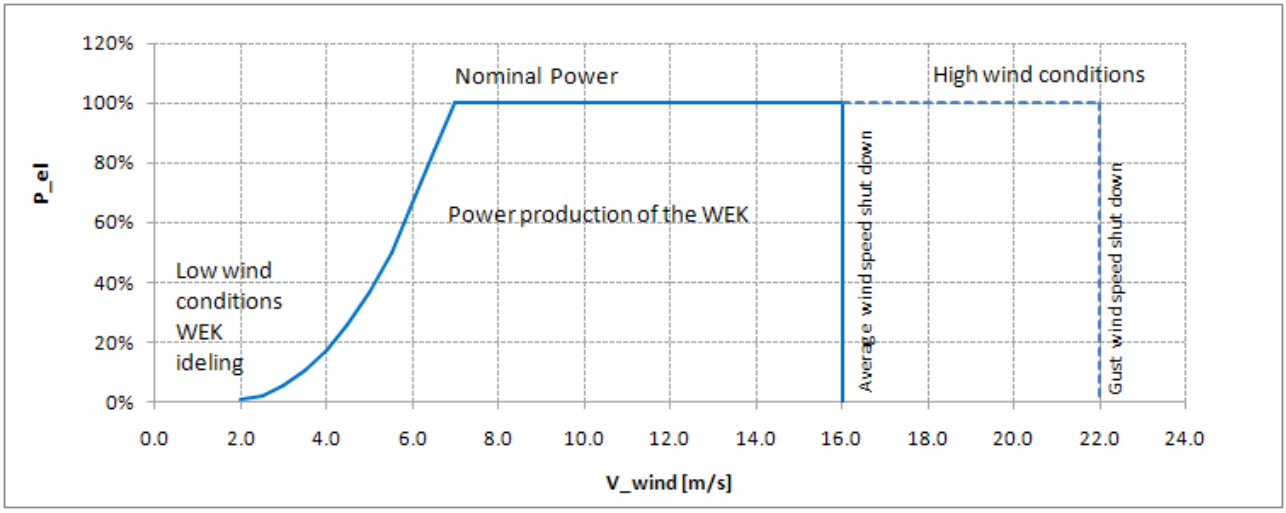


Figure 1 – TN535 operating range.

It is possible to identify 6 main statuses during which the Product is active. In addition, the Product may enter certain temporary statuses of transition or testing (battery tests, sensor tests, etc.).

E.1.1. Parking

When parked, the blades are in feathering position (collective blade Pitch Angle of approximately 90°). In this mode, the rotor speed is equivalent to 0.6 rpm for every m/s of wind.
This status may occur following:

- excessive wind;
- error;
- cable unwinding (when the cables are wound too far, the Product implements a procedure to unwind them. It is not therefore an anomaly if the Product puts itself into park position and executes a few revolutions of the Nacelle).

E.1.2. Waiting

In the event that the wind speed is below that required for activation, the Product will place itself with the blades in the waiting position (collective blade Pitch Angle at about 40°).
The rotor is free. The yaw control is active.

E.1.3. Starting

Whether the average rotor speed (over 100s) exceeds **11 rpm** or the instantaneous rotor speed exceeds 20 rpm, the turbine will arrange the blades in working position (collective

blade Pitch Angle about 2°). The inverters start up at the same time. The yaw control is active.

E.1.4. Production

Up to a rotor speed of 66 rpm the Product keep the blades fixed in starting position, maintaining a point of maximum efficiency by means of the control system which regulates the power converter as required.
Once a speed of 66 rpm is reached, the PLC control algorithm maintains the rotor at a constant speed by controlling the blade's pitch as required. Once a speed of 66 rpm is reached, the power output from the converter will also remain constant.
In production status the yaw control is active.

E.1.5. Shut-down due to insufficient wind

If the rotor speed drops below 22 rpm (average speed over 360 second) while the Product is operating in production status or if the instantaneous rotor speed drops below 8 rpm, the Product will go into the status of waiting.
The yaw control is active.

E.1.6. Shut-down due to excessive wind

If the wind speed exceeds 16 m/s (average speed over 480 s) or reaches an instantaneous wind speed exceeding 22 m/s while the Product is operating in production status, the Product will activate the safe status of parking.
The PLC will automatically return to starting and production statuses.
The yaw control is active.

E.2. Monitoring and maintenance

Performance and safety attributes of the Product are ensured by means of monitoring and maintenance.

Only Tozzi Nord trained and authorized personnel are qualified to carry out monitoring procedures and maintenance operations.

F. WARRANTY CONDITIONS

F.1. Warranty

Tozzi Nord provides a 24 month guarantee on the Product starting from the date of signing the Installation Report.

The guarantee conditions are set out in the Product Sales Contract Agreement.

G. TECHNICAL DATA

G.1. Main data

Turbine Architecture:

Type	Upwind rotor with active pitch control and active yaw control
Direction of rotation	Clockwise (upwind view)
Number of blades	3
Rotor diameter	13.2 m
Hub height	15-18-24 m
Rated power	9.9 kW
Power regulation	Active pitch (pitch to feather)
Cut-in wind speed	2.5 m/s
Cut-out wind speed	16 m/s
Rated wind speed	6.7 m/s
Rotor diameter	13.2 m
Rotor swept area	136.7 m^2

Rotor

Type	LWTB535
Blade length	6.344 m
Material	GFRP
Lightning protection	Optional
Hub	Fixed (no tilt)

Drive train

Transmission	Belt drive
Main bearing	Single-row ball bearing
High speed shaft Rotational Speed	225-750 rpm
Low speed shaft Rotational Speed	20-66 rpm
Grid feed Inverter	ABB ACS M1

Generator

Nominal power	11.0 kVA
Type	Permanent Magnets Synchronous Generator 8 poles
Protection	IP54
Insulation class	F

Yaw System

Yaw Type	Active yaw control
Yaw Rate	3.35 deg/s

Controller

Type	PLC
Remote monitoring	Tozzi Nord SCADA / Real Time Viewer
UPS	2x12V BACK UP batteries

Breaking System

Aerodynamic brake	Collective pitch, (3 pitch linear actuator rates: 14, 21, 48 mm/s)
Redundant aerodynamic brake	Passive centrifugal system that brings blades to braking position
Rotor lock	Metal pin inserted for maintenance

Tower

Tower height	14.6m-17.6m-23.6m
Tower type	Polygonal steel Tower, 16 sides, 2 sections
Design wind class	IV

Weights

Nacelle (excluding Rotor and Hub)	783 kg
Rotor (including Hub)	332 kg
Tower	1300kg (14.6m) - 1750kg (17.6m) - 3350kg (23.6m)

Noise Emission

Max L_{WA} @10m/s	87.1 dB

H. ALARMS AND WARNINGS

H.1. Alarms

F5 display mode reports any anomalous situations regarding the operational status of the Product. Alarm status implies that the Product is out of operation.
Please report any alarm found by reading F5 display mode to the Tozzi Nord Technical Assistance Centre. The alarm list is reported below.

Code	Description
1	Alarm-Flag Standby
2	Alarm-Flag Off
3	Alarm-Flag Manual
6	Alarm-Flag Emergency stop activated
8	Alarm-Flag Cable wound up to the right
9	Alarm-Flag Cable wound up to the left
10	Alarm-Flag Software flag "Machine off"
11	Alarm-Flag Switch clock "Machine off"
12	Alarm-Flag Strong wind shut down, by average
13	Alarm-Flag Strong wind shut down, by peak
16	Alarm-Flag Supply 28VDC grid
17	Alarm-Flag Supply 28VDC linear drive
18	Alarm-Flag Supply 28VDC to low (Level 2)
19	Alarm-Flag Invalid wind direction measurement
20	Alarm-Flag Grid monitoring interface triggered
28	Alarm-Flag Runtime of yawing too long
29	Alarm-Flag Sensor 1 for rotor speed measurement defective
30	Alarm-Flag Sensor 2 for rotor speed measurement defective
31	Alarm-Flag Winding protection of yawing motor triggered
32	Alarm-Flag Test battery voltage
33	Alarm-Flag Function of vibration sensor
34	Alarm-Flag Failure of generator temperature measurement
35	Alarm-Flag System test failed
36	Alarm-Flag Supply 28VDC for sensors
37	Alarm-Flag Supply 28VDC to low (Level 1)
40	Alarm-Flag A yawing sensor is defective
41	Alarm-Flag Generator winding problem
42	Alarm-Flag Excessive rotor speed 3
51	Alarm-Flag Could not find parking position
52	Alarm-Flag Could not find waiting position
53	Alarm-Flag A linear drive position sensor defective
54	Alarm-Flag Runtime linear drive "OUT" too long
55	Alarm-Flag Runtime linear drive "BACK" too long
56	Alarm-Flag Inverter
57	Alarm-Flag Overtemperature generator
58	Alarm-Flag Speed rotor/generator not synchronous
60	Alarm-Flag Excessive rotor speed 1
61	Alarm-Flag Excessive rotor speed 2
62	Alarm-Flag Vibration sensor triggered
63	Alarm-Flag Generator Short Circuit
64	Alarm-Flag Fault Grid Inverter
65	Alarm-Flag Fault Gen Inverter
66	Alarm-Flag PLC WD Engaged

H.2. Warnings

F4 display mode reports any anomalous situations regarding the operational status of the Product (warnings). A warning does not imply that the Product should be put out of operation.
Please report any warning found by reading F4 display mode to the Tozzi Nord Technical Assistance Centre.
The warning list is reported below.

Code	Description
83	Warning-Flag Wind vane not mooving
84	Warning-Flag Change PLC battery
85	Warning-Flag TimeOut communication inverter
87	Warning-Flag Test battery capacity
89	Warning-Flag reduced rotor speed
90	Warning-Flag Icing condition
91	Warning-Flag Derating for over-temperature
92	Warning-Flag Derating for vibration